

Unit 4 – Characteristics of Functions

PRACTICE

Expectation	Level Achieved
D1 - demonstrate an understanding of average and instantaneous rate of change, and determine, numerically and graphically, and interpret the average rate of change of a function over a given interval and the instantaneous rate of change of a function at a given point	

1. Find the rate of change of Pete's weight from 13 to 15 years and between 14 and 15 years. How would you explain the results?

Age (years)	13	14	15	16	17	18
Weight (kg)	37	45	42	48	49	52

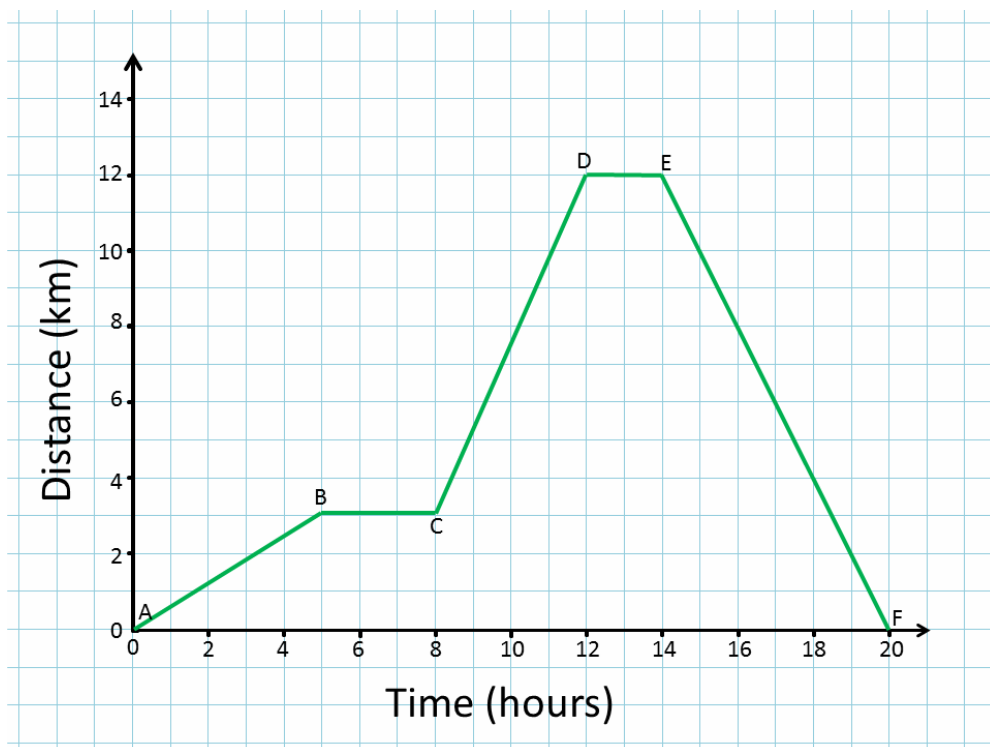
2. Suppose that the weight in grams of a cancerous tumor at time t is $W(t) = 2t^3$, where t is measured in weeks.

a) What is the instantaneous rate of growth of the tumor (in grams per week) when $t = 5$?

b) The doctor wants to operate while the tumor is growing slower than 81 grams per week. When can the doctor operate?

3. The depreciation of a car with an initial value of \$25000 dollars is modeled by the function $P(t) = 25000(0.85)^t$ where ' t ' is in years. What is the average rate of change of the investment between year 5 and 9?

4. The graph below shows the distance a family travels on a trip to the beach versus the time it takes to get there and back home again.



- a. What is the average rate of change in distance over the entire trip?
- b. What is the average rate of change between the 5th and 12th hour?
- c. What is the instantaneous rate of change at $t=3$?

Expectation	Level Achieved
D2 - determine functions that result from the addition, subtraction, multiplication, and division of two functions and from the composition of two functions, describe some properties of the resulting functions, and solve related problems	

5a) If $f(x) = 4x^2 - 11$ and $g(x) = -3x^2 - 2$, determine

$$\begin{array}{llll}
 f(x) + g(x) & f(x) \bullet g(x) & 3f(g(x)) & g \circ f(2) \\
 2f(x) - g(x) & f^{-1}(x) & f^{-1}[f(x)] & f \circ g(x)
 \end{array}$$

b) State the **domain and range** of each combined function above.

c) Graph $g \circ f(x)$

Expectation	Level Achieved
D3 - compare the characteristics of functions, and solve problems by modeling and reasoning with functions, including problems with solutions that are not accessible by standard algebraic techniques.	

6. Solve the following **graphically**:

$$4 \cos x = 3x - 2$$

$$2^{x+1} = -x$$

$$\log x = \sin x, 0 < x < 6$$

9. **Sketch** a possible function with the following properties:

- **IROC** = 0 when $x = 7, 5, 3$
- **AROC** > 0 when $x < 3$
- $f(x) > 0$ when $x > 7$